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Case Report

Popliteal artery embolism of bullet after abdominal gunshot wound

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ABSTRACT

Bullet embolism to the peripheral arterial system is a rare phenomenon which frequently results in misdiagnosis due to lack of early symptoms. Embolisms can go to either arterial or venous systems with common sites of injury including the left ventricle, pulmonary vein, thoracic and abdominal aorta and peripheral arteries. Herein we present a case of a 19 year old patient with multiple gunshot wounds to the torso with a bullet embolism to the left popliteal artery necessitating embolectomy. This subsequently led to diagnosis and repair of an abdominal aortic pseudoaneurysm not clearly evident on initial imaging.

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Introduction

Bullet embolism to the peripheral arterial system is a rare phenomenon, which frequently results in misdiagnosis due to lack of early symptoms. Thus, it is understandable that the exact incidence of bullet embolization is uncertain but is estimated to be around 0.5% in studies involving almost 8000 casualties of war [1]. Embolisms can go to either arterial or venous systems with common sites of injury including the left ventricle, pulmonary vein, thoracic and abdominal aorta, and peripheral arteries. Morbidity for a retained projectile is substantial, and complications include limb-threatening ischemia, sepsis, pulmonary embolism, endocarditis, cardiac valvular incompetence, cerebrovascular accidents, and death [1–3]. Suspicion for bullet embolism should be raised when

entry and exit wounds are discordant. We present a case of an incidentally noted bullet embolism to the left popliteal artery from a gunshot wound to the abdomen.

Case report

A 19-year-old African American male was brought to the emergency department after multiple gunshot wounds to the extremities and thorax. The precise make and model of the weapon was unknown. Patient was alert and oriented with Glasgow Coma Scale of 15 on arrival. Initial vital signs were blood pressure, 179/94; heart rate, 93 bpm; respiratory rate, 22 breaths/min; peripheral O₂ sat of 100%; and 10 of 10 pain.

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Fig. 1 – Initial trauma radiograph of the left femur demonstrated a radiopaque density projecting over the left knee joint that was separate from the primary bullet entry into the left femur.



Fig. 2 – Dedicated AP radiograph of the left knee demonstrated the bullet overlying the medial compartment joint space in unchanged position and orientation compared to initial trauma radiograph.

Physical examination revealed multiple gunshot wounds to the back, right forearm, and left femur.

Admission radiograph of the left femur revealed a bullet fragment projected over the knee joint (Fig. 1). Subsequent dedicated left knee radiographs confirmed a 1-cm bullet fragment within the popliteal fossa (Figs. 2 and 3). Additional follow-up noncontrast computed tomography (CT) of the left lower extremity was limited by the lack of intravenous contrast and motion but demonstrated an intraluminal radiopaque density felt to be within the left popliteal artery. There was no surrounding induration, hematoma, or bullet tract (Figs. 4 and 5).

CT on admission demonstrated retroperitoneal induration and circumferential hemorrhage at the level of the celiac axis with a blush of contrast along the right paramidline aspect of the aorta consistent with active extravasation along with retained

bullet fragments in the right psoas muscle, L1 vertebral body, and multiple posterior-to-mid thoracic vertebra (Fig. 6).

The patient was subsequently taken to the operating room for left popliteal embolectomy to prevent further complications. Preoperative evaluation demonstrated palpable pulses bilaterally. Intraoperative angiogram of the left lower extremity demonstrate the bullet in the left popliteal artery (Fig. 7). Postembolectomy angiogram of the left lower extremity demonstrated no residual intraluminal bullet fragments (Fig. 8).

After successful extraction of the bullet embolus, CT angiography of the abdomen demonstrated posttraumatic pseudoaneurysm of the aorta with worsening hemorrhage (Fig. 9).

Patient was again taken to the operating room for an open pseudoaneurysm repair and discharged 8 days later after an uncomplicated hospital course.



Fig. 3 – Dedicated lateral radiograph of the left knee localized the bullet to the popliteal fossa.

Discussion

Bullet embolism should be suspected when entry and exit wounds are discordant or symptoms incompatible with original injury arise. This patient received numerous gunshot wounds to the trunk and left lower extremity; however, the gunshot wound to the left lower extremity had concordant entry and exit wounds thus precluding embolism via this route.

This case report demonstrates how an abdominal gunshot bullet enters the abdominal aorta at the level of the celiac artery and was carried to the knee through the arterial circulation. Embolisms usually follow the flow of blood with less than 15% of cases resulting in retrograde obstruction. A popular explanation for this phenomenon is gravity, which in this case would be consistent with the proposed route of migration [1].

Ideal conditions for bullet embolization are for the ballistic projectile to contain the appropriate amount of kinetic energy to penetrate only a single wall of the vessel, settle within the lumen, and have the necessary shape and diameter to result in obstruction. Generally, bullet embolization in the arterial system will result in early symptoms in



Fig. 4 – Follow-up noncontrast computed tomography of the left lower extremity demonstrated an intraluminal radiopaque density, which appeared to be within the left popliteal artery with no surrounding induration, hematoma, or bullet tract.

approximately 80% of cases [3,4]. However, occasionally, these symptoms manifest late resulting in delayed treatment and increased morbidity. Complications from a retained projectile include limb-threatening ischemia, sepsis, pulmonary embolism, endocarditis, cardiac valvular incompetence, and cerebrovascular accidents with missed emboli proving to be fatal. It is also important to consider that embolization of a projectile is possible in the venous system.

Conservative management has been reported previously [5], however, embolectomy is the gold standard in management of peripheral bullet arterial emboli [1,3]. Furthermore, when bullet embolus is visualized, there is raised suspicion for traumatic vascular injury. This report presents an example of peripheral arterial embolus generating a higher index of suspicion for aortic injury. In this case, subsequent CT angiography imaging demonstrated prompt diagnosis of a posttraumatic pseudoaneurysm at the level of the celiac trunk (Fig.9).

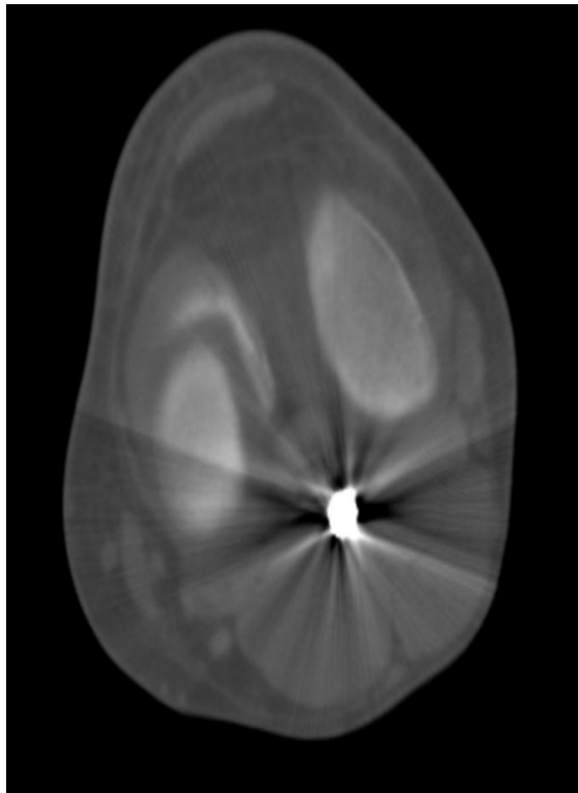


Fig. 5 – Follow-up noncontrast computed tomography of the left lower extremity demonstrated an intraluminal radiopaque density, which appeared to be within the left popliteal artery with no surrounding induration, hematoma, or bullet tract.



Fig. 7 – Intraoperative left lower extremity arterial angiogram at the level of the knee joint demonstrated a filling defect (arrow) with subtle flow past the bullet consistent with a partially occlusive bullet (arrow) within the left popliteal artery. Embolectomy was performed with subsequent images revealing bullet removal with return of flow within the left lower extremity arterial system.



Fig. 6 – Computed tomography on admission demonstrated retroperitoneal induration and circumferential hemorrhage at the level of the celiac axis with a blush of contrast along the right paramidline aspect of the aorta consistent with active extravasation (arrow).



Fig. 8 – Intraoperative left lower extremity arterial angiogram at the level of the knee joint demonstrated a filling defect (arrow) with subtle flow past the bullet consistent with a partially occlusive bullet (arrow) within the left popliteal artery. Embolectomy was performed with subsequent images revealing bullet removal with return of flow within the left lower extremity arterial system.

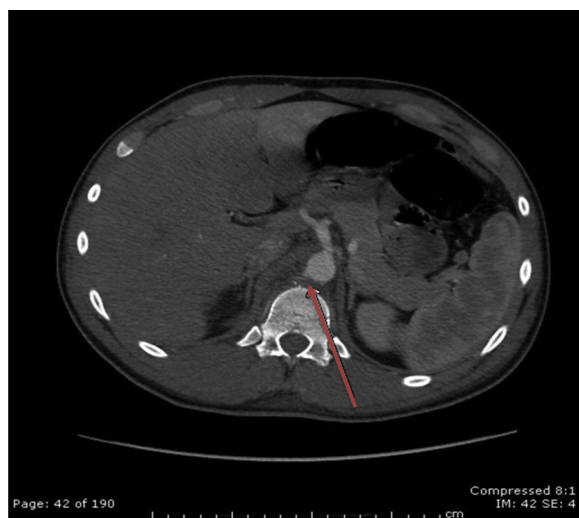


Fig. 9 – Postoperative abdominal computed tomography angiography demonstrated a focal contour abnormality of the right posterior lateral wall of the abdominal aorta at the level of the celiac trunk concerning for posttraumatic pseudoaneurysm (arrow).

Conclusion

Incidental finding of bullet embolization should raise suspicion of traumatic vascular injury and prompt rapid surgical consultation for a subsequent embolectomy.

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